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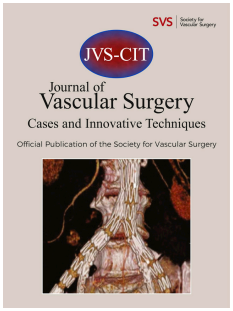

EMERGENT OPEN CONVERSION FOR STENTGRAFT DEPLOYMENT FAILURE IN A RUPTURED THORACIC ANEURYSM

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PII: S2468-4287(20)30192-1

DOI: https://doi.org/10.1016/j.jvscit.2020.10.017

Reference: JVSCIT 654

To appear in: *Journal of Vascular Surgery Cases and Innovative Techniques*

Received Date: 3 September 2020

Accepted Date: 30 October 2020

Please cite this article as: C. Kohler, T.R. Wyss, N. Mertineit, V. Makaloski, J. Schmidli, EMERGENT OPEN CONVERSION FOR STENTGRAFT DEPLOYMENT FAILURE IN A RUPTURED THORACIC ANEURYSM, *Journal of Vascular Surgery Cases and Innovative Techniques* (2020), doi: https://doi.org/10.1016/j.jvscit.2020.10.017.

EMERGENT OPEN CONVERSION FOR STENTGRAFT DEPLOYMENT FAILURE IN A RUPTURED THORACIC ANEURYSM

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Abstract

Thoracic endovascular aortic repair (TEVAR) is standard for ruptured thoracic aortic aneurysm (rTAA) (1). A ninety-two y/o men presented with acute severe back pain in a stable condition. Computed tomography revealed a rTAA. TEVAR (Valiant™, Medtronic-Vascular) into zone 2 with intentional coverage of the left subclavian artery was planned. After release of the stentgraft body proximal release of bare springs was impossible. Troubleshooting techniques were applied, but tip capture could not be released. Emergent conversion to open repair was performed. Intraoperative device deployment failure in TEVAR is rare. This case report demonstrates the advantage of having in-house cardiac surgery backup.

Introduction

Thoracic endovascular aortic repair (TEVAR) is the preferred treatment option for ruptured thoracic aortic aneurysm (rTAA) provided the morphology is suitable (1). This is a case report of a device failure provoking emergent conversion to open aortic arch repair. The patient gave his consent to publish this report.

Report

An active ninety-two years old male patient presented with acute severe back pain in hemodynamically stable condition. He has a history of a ruptured infrarenal aortic aneurysm treated by open repair 23 years ago and a TEVAR due to a descending thoracic aortic aneurysm 17 years ago. A distal TEVAR extension was performed 6 years ago due to a type Ib endoleak. The patient suffers from sinus bradycardia for which he underwent pacemaker implantation 6 years ago. Computed tomography angiography (CTA) revealed a ruptured aneurysm of the descending aorta with a maximum diameter of 88mm caused by a type Ia and III endoleak (Figure 1). Additionally, a bovine arch was present. Zones 0-3 were diseased with a maximum diameter of 50 mm in zone 3 and 42mm in zone 2 (oversizing 10%). Urgent treatment was indicated. A TEVAR extension into zone 2 with intentional coverage of the left subclavian artery was planned. By percutaneous transfemoral access a Valiant™ Thoracic Stentgraft (proximal bare springs, straight configuration, diameter 46 mm, length 150 mm, Medtronic Vascular, Santa Rosa, California, USA) was placed in the aortic arch. Stentgraft insertion was without difficulty. The release of the stentgraft was performed under rapid right ventricular pacing by retracting the integrated slider handle. Then the tip capture release handle at the rear of the delivery system was unlocked and retracted, but the tip capture did not release the proximal bare springs. For the

Freeflo™ stentraft delivery system, the proximal bare stent is constrained by the tip capture mechanism, if the tip capture mechanism fails, the proximal bare springs remains locked (Figure 2). The delivery system could not be withdrawn since the stentgraft body was deployed. The manufacturer's instructions for use were consulted for troubleshooting techniques "alternative instruction for deploying tip capture mechanism": the backend lock was removed and delivery system was pulled of, clamping ring was removed, the tip capture tube was tried to retract, but bare metal stent could not be released. Further endovascular means (e.g. balloon disruption/dilatation of captured tip) were not considered due to unpredictable stroke risk. As bailout, the decision to perform emergent conversion to open repair was made. Sternotomy, deep hypothermic circulatory arrest, total arch repair with bypasses to all supra aortic vessels under continuous selective antegrade cerebral perfusion was performed (Figure 3). The proximal bare springs of the stentgraft were cut off the delivery system with wire forceps. The rupture side could be verified. The delivery system was withdrawn. Patient was always hemodynamically stable and showed good recovery. On the 7 th postoperative day ,CTA revealed a persisting low-flow type III or IV endoleak in the stentgraft overlap zone in the aneurysm sac at the descending aorta. Therefore, a fourth thoracic stentgraft was implanted in a second operation 9 days postoperatively. Finally, complete aneurysm exclusion was achieved without any endoleak (Figure 4). The postoperative course was uneventful. The patient recovered well without complications; he was discharged to rehab on the 15th postoperative day.

Discussion

Endovascular treatment still remains first line treatment of pathologies of the descending aorta (1). An open repair including left heart bypass is more invasive, but can be useful in the presence

of rupture (7). Considering the patient's age, TEVAR was favoured as most reasonable therapy. Intraoperative device deployment failure in TEVAR is rare. Three prospective, multicentre, nonrandomized clinical studies with the same device (2-4) reported no graft complications and 100% successful delivery and deployment of the stent graft. (5) One-year results of the rescue trial demonstrate no conversion to open repair. Another study reported device-related complications of 12.5% in aortic dissection but no device deployment failure (6). There were device deployment failure issues concerning a stentgraft for EVAR from another company many years ago, which lead to device retrieval. We filed a report to the Swiss Medical Device Vigilance Agency (SWISSMEDIC) and to the device company for device investigation. Based on review of the procedural films and analysis of the delivery system the cause of the deployment/expansion difficulties could not be conclusively determined. If conversion to open repair is inevitable, in-house availability of a cardiac surgery service can be lifesaving. This case report demonstrates that a maximal invasive therapy for initially minimal-invasive intention to treat may be necessary in an extremely rare condition. Nevertheless, the indication for treatment must be made individually.

Conclusion

Intraoperative stentgraft deployment failure is extremely rare. Deployment difficulties/failures are recognized as a potential adverse event associated with the implantation of a stentgraft. If all strategies of troubleshooting techniques fail, conversion to open surgery may be the last option to rescue the patient. This case report demonstrates the advantage of having an in-house cardiac surgery backup to treat such pathologies.

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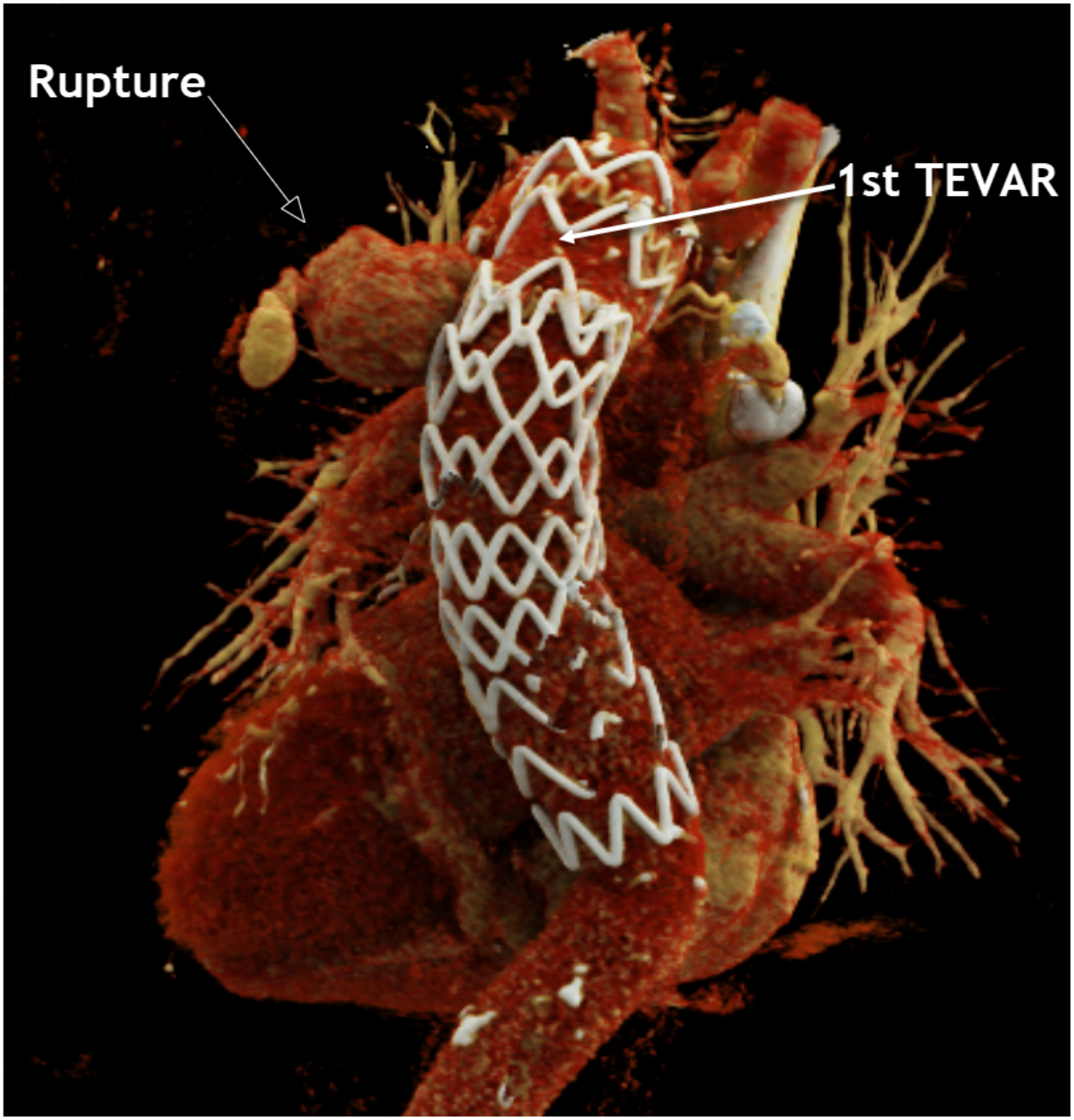
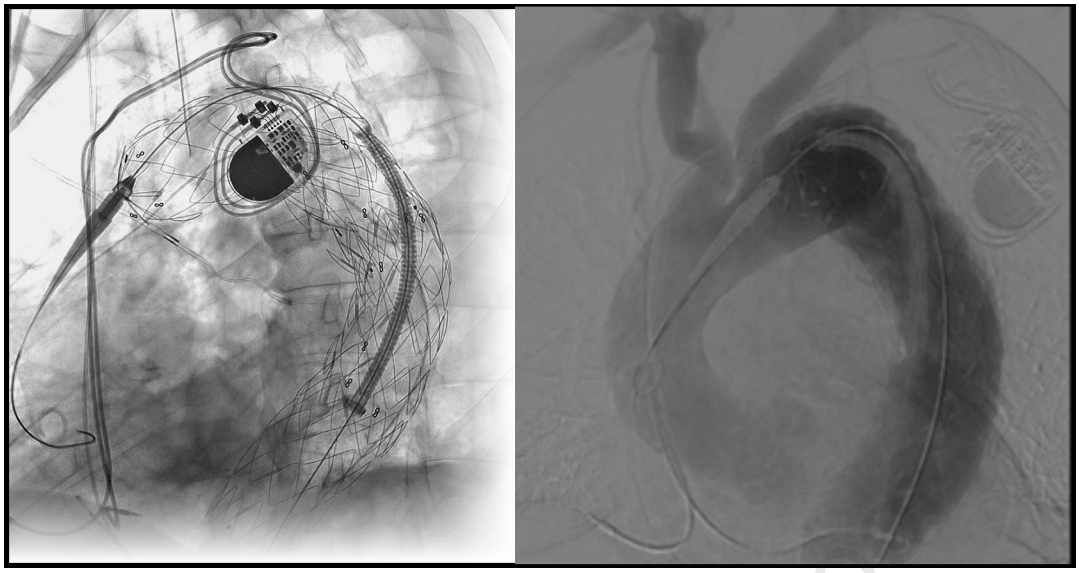
Figure 1. CT angiography (3D) showing rupture of the thoracic aneurysm due to type 1a endoleak.

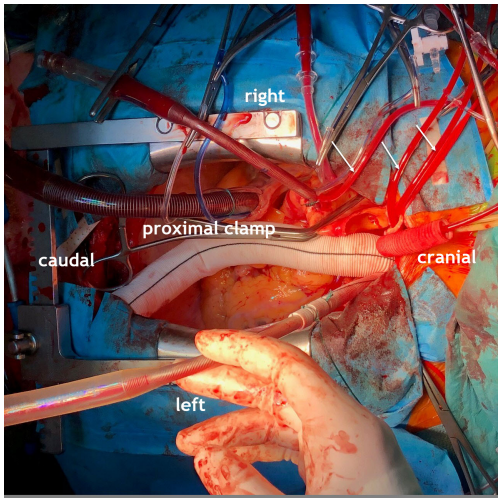
Figure 2. Deployed stentgraft in the aortic arch. Failure of tip capture release mechanism.

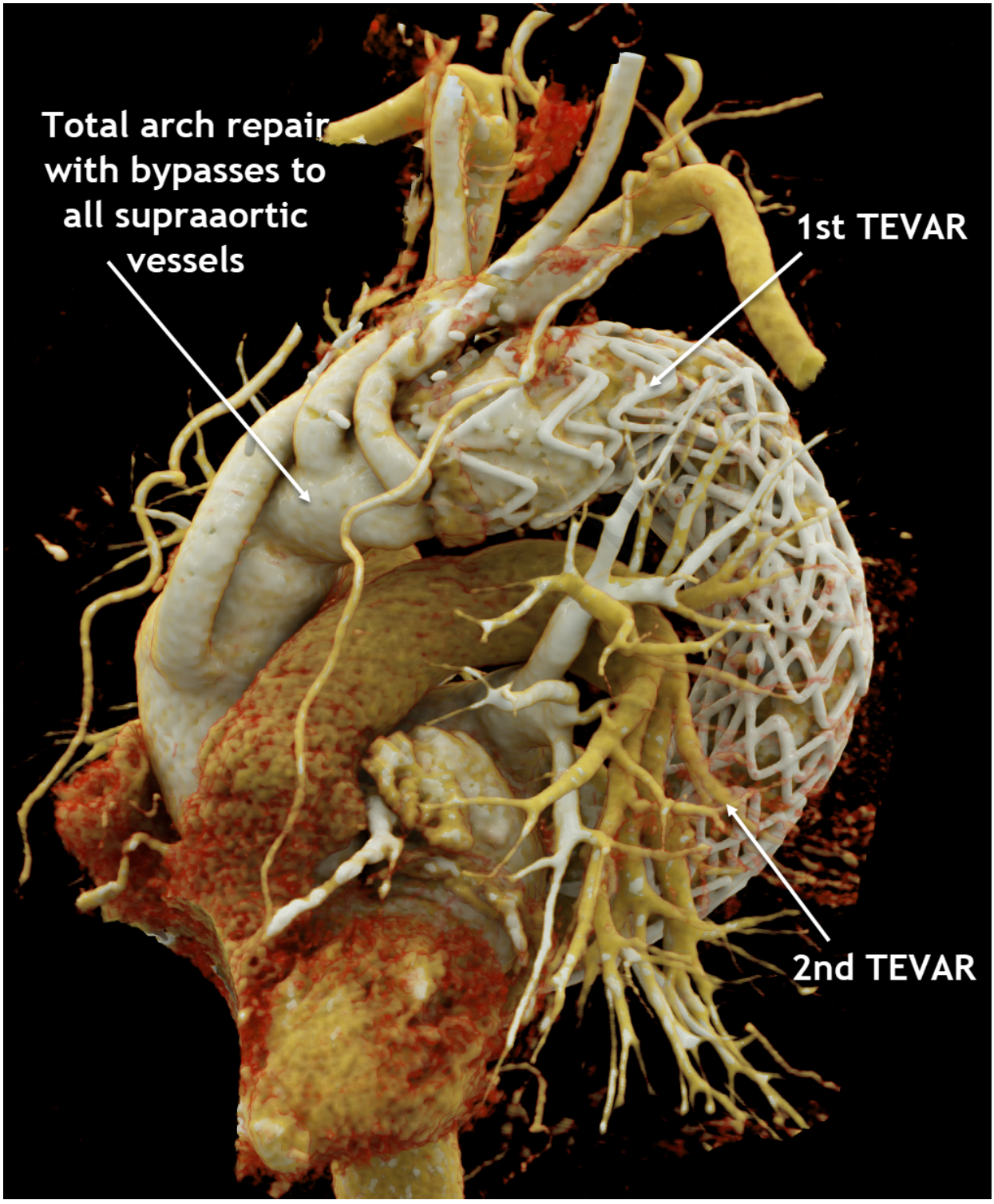
Figure 3, Intraoperative view during total arch repair under continuous selective antegrade cerebral perfusion (lines with arrows)

Figure 4. Final CT angiography (3D) demonstrating no endoleak


Rupture
1st TEVAR






Total arch repair with bypasses to all supraaortic vessels
1st TEVAR
2nd TEVAR